LBNL-49569 Abs.

The SNS Front-End, an Injector for a High-Power Hydrogen-Ion Accelerator*

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Abstract.
The Spallation Neutron Source, SNS, will be an accelerator-based facility in Oak Ridge, TN, delivering pulsed neutron beams to experimenters. Negative hydrogen ion-beams will be generated and pre-accelerated in a 2.5-MeV linac injector or front end (FE), accelerated to 1 GeV energy by a linear accelerator system, converted into protons and accumulated in a ring accelerator, and then directed towards a mercury target to generate the neutrons. The proton beam will arrive at the target in bursts of less than 1 ms duration and with more than 1 MW average power. The SNS is a collaboration of six US Laboratories: Argonne National Laboratory (ANL), Brookhaven National Laboratory (BNL), Thomas Jefferson National Accelerator Facility (TJNAF), Los Alamos National Laboratory (LANL), E. O. Lawrence Berkeley National Laboratory (LBNL), and Oak Ridge National Laboratory (ORNL).** The front end is being built by LBNL and scheduled to be completed by June, 2002. Of the major FE subsystems, the rf-driven H- ion source, the electrostatic Low-Energy Beam Transport (LEBT) system, and the full Radio-Frequency Quadrupole (RFQ) pre-accelerator have been commissioned, and commissioning of the full system including the elaborate Medium-Energy Transport (MEBT) system is imminent. This paper provides an overview of FE major design features, highlights of the component fabrication process, and experimental results obtained during the commissioning process. After successful completion, the FE could be viewed as a prototype of a high-current, high duty-factor injector for other accelerator projects or, without the elaborate MEBT, as an independent 2.5-MeV accelerator for various applications.

* This work is supported by the Director, Office of Science, Office of Basic Energy Sciences, of the U.S. Department of Energy under Contract No. DE-AC03-76SF00098.

** SNS is managed by UT-Battelle, LLC, under contract DE-AC05-00OR22725 for the U.S. Department of Energy.